

Midterm (75 minutes)

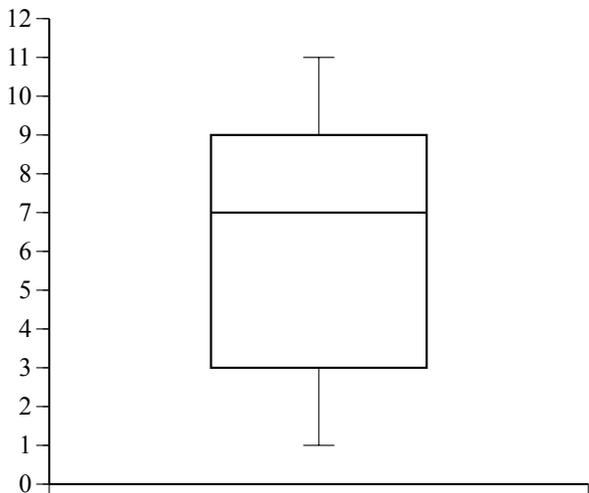
No calculators allowed. Just set up your answers, for example, $P = 49/52$. BE SURE TO EXPLAIN YOUR REASONING. If you want extra time, you can buy time at a price of 1 point a minute; for example, if your test is handed in 10 minutes after the scheduled finish time, 10 points will be subtracted from your test score.

1. For each of these studies of Econ 57 data, identify the type of graph (histogram, side-by-side box plots, scatter diagram, or time series graph) that would be the MOST appropriate.
 - a. Are final exam scores normally distributed?
 - b. Can midterm scores be predicted from homework scores?
 - c. Is there more dispersion in midterm or final exam scores?
 - d. Has there been a trend in course grades over the past 20 years?
 - e. Compare the final exam scores of students who sit in the front row with students in the back row.

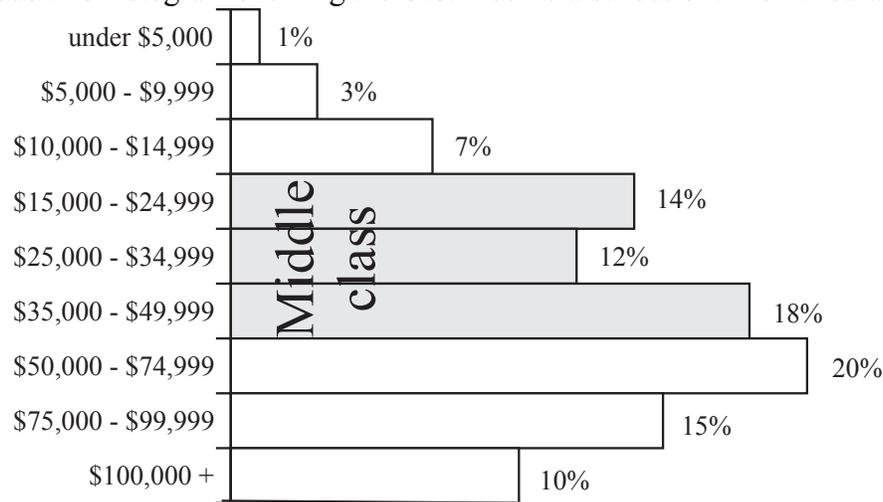
2. As a statistician, how would you respond to this story:

Marriage is good for the heart.
A study of more than 3.5 million Americans found that married folks are less likely to suffer heart or blood-vessel problems than their divorced, widowed or single counterparts.
“The benefits were seen for both men and women,” said Dr. Jeffrey Berger, a cardiologist at NYU Langone and co-author of the study.... “A partner can encourage you to move more, watch what you eat, see a health professional on a regular basis, things like that,” Berger said.

3. Draw a freehand sketch of two side-by-side boxplots, one the boxplot shown below and one the boxplot if all the data in the boxplot below are multiplied by 2.



4. How would you redo this histogram showing the U.S. income distribution? Don't redraw it, just explain.



5. Jo played a poker app 1,000 times, recording her initial five cards every time. Her 47th and 48th hands were the same:

Hand 47: 3 of hearts, Ace of hearts, 3 of clubs, 10 of clubs, 7 of clubs

Hand 48: 10 of clubs, Ace of hearts, 3 of clubs, 7 of clubs, 3 of hearts

If the five cards were randomly selected from a standard deck of 52 cards, what is the probability that there will be at least one occasion when the same hand is dealt twice in a row?

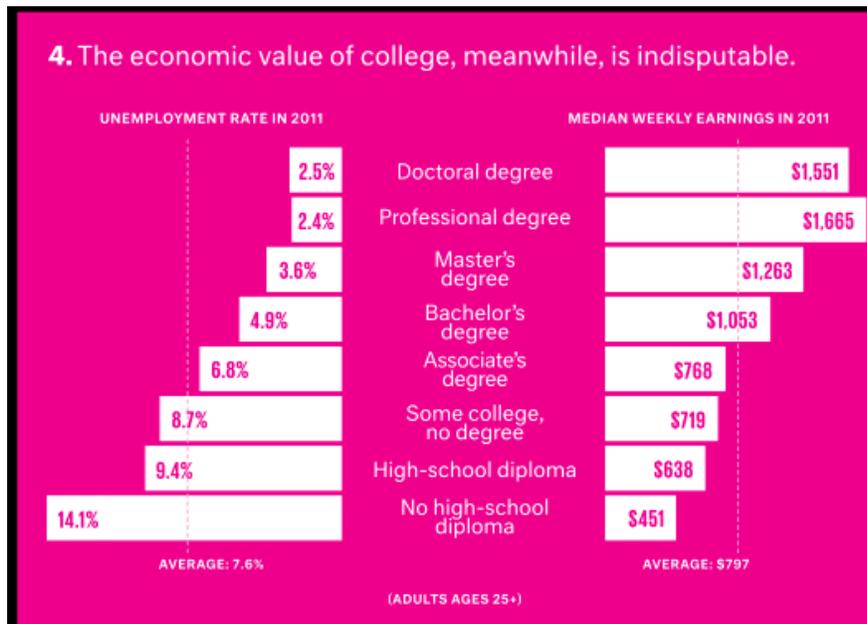
6. A 2013 Bloomberg Businessweek article noted that Warren Buffett's Berkshire Hathaway had underperformed the S&P500 for four months in a row, June, July, August, and September, 2013, and concluded that "Berkshire stock is due for a comeback vs. the S&P." Do you agree?

7. A routine examination discovers a lump in a female patient's breast. Only 1 out of 100 such lumps turns out to be malignant, but, to be safe, the doctor orders a mammogram X-ray test. If the lump is malignant, there is a 0.80 probability that the mammogram reading will be positive; if the lump is benign, there is a 0.90 probability that the reading will be negative. The test comes back positive and the doctor orders a second test, which comes back negative. Assuming the test results to be independent, what is your estimate of the probability that this lump is malignant?
8. In the card game Blackjack (or "21"), a face card (Jack, Queen, and King) is worth 10 points, an Ace is worth 1 or 11 points, and the other nine cards are worth their face value; e.g., a Two is worth 2 points. A player's score is the sum of the value of his or her cards. For example, a Jack and a Six are 16 points; a Queen and an Ace are either 11 or 21 (the player would choose 21). What is the probability that a player's initial two cards will have a score of 20 or 21?

9. In the gambling game Chuck-A-Luck, a player can bet \$1 on any number from 1 to 6. Three dice are thrown and the payoff depends on the number of times the selected number appears. For example, if you pick the number 2, your payoff is \$4 if all three dice have the number 2. What is the expected value of the payoff?

Number of dice with selected number	0	1	2	3
Payoff (dollars)	0	2	3	4

10. *The Atlantic* recently published this figure, demonstrating that “The economic value of college, meanwhile, is indisputable”:



A blogger agreed: “The statistics are very clear: The more education you have, the more money you will make and the less likely you will be to be unemployed.” Do you agree?